

WHY DON'T YOU JUST EAT THE CAN?

Grades: 11-12

Subjects: mathematics, chemistry, physical science
Skills: analyzing, classifying, comparing, computing, evaluating, interpreting, measuring, small group work

Group Size: whole class, small group

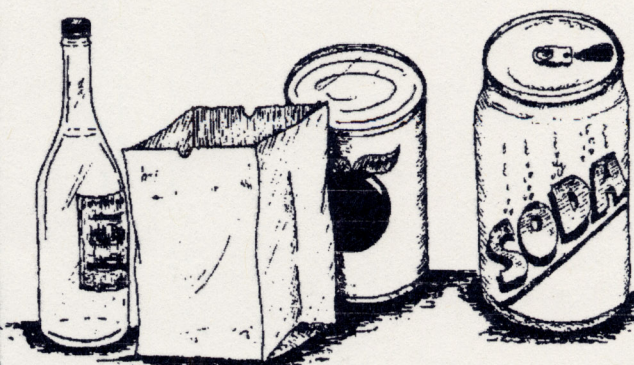
Setting: classroom, laboratory

DOE Performance Standards: mathematics-G56, I72, M96, R121, T144, A1014, C1042

4Rs Framework: I.F.4, III.B.1

Vocabulary: Btu, calorie, Calorie

Time: 1 period



Objectives Students will: (1) distinguish between the terms calorie, Calorie, and Btu, (2) calculate the amount of energy used to produce different food containers, (3) compare the energy used to produce food containers with the energy contained in the food items themselves, and (4) determine the amount of energy that can be conserved by using recycled packaging materials.

Method Students use measurements of mass and conversion factors to calculate the energy used to produce food containers. They then compare these values with the energy contained in the actual food items.

Background The unit used to measure heat energy is the calorie (cal.), also called gram-calorie or small calorie. It is defined as the amount of heat energy needed to raise the temperature of one gram of water one degree celsius.

In nutrition, the unit used to measure food energy is the Calorie (Cal.), also called kilogram-calorie, or great calorie. It is defined as the amount of heat energy needed to raise the temperature of one kilogram of water one degree celsius. One Calorie (kcal) is equal to 1000 calories.

The small c, capital C difference is important. Only the nutritional calorie uses capital C.

Engineers use a different heat energy standard called the British thermal unit (Btu). It is defined as the quantity of heat energy required to raise the temperature of one pound of water one degree Fahrenheit. One Btu = 252 calories or .252 Calories.

For purposes of conversion:

1 pound = 454 grams
$^{\circ}\text{C} = 5/9 (^{\circ}\text{F} - 32)$
1 kilogram = 2.2 pounds

Conservation of energy is as important as finding alternative sources of energy. Energy can be conserved by careful buying and recycling of paper, glass, metal, and plastic packaging materials.

The energy savings from recycling are tremendous. For example, to make one ton of newsprint from virgin pulp requires 30 million Btus, while making a ton of newsprint from recycled stock only requires 10 million Btus. Likewise, making a ton of glass from raw materials requires 16 million Btus while less than 15 million Btus are needed to make a ton of glass from recycled glass pieces. The most striking energy savings are associated with aluminum production. The energy cost of one ton of aluminum from bauxite ore averages 250 million Btus. Less than 13 million Btus are needed to produce a ton of aluminum from scrap.

Materials balances or scales, miscellaneous food containers (paper, glass, metal, plastic), Btu worksheet (one per group), calculators (*optional*)

Procedure

1. A few days before the activity is scheduled, ask students to bring in several different empty food containers that include information regarding the calorie content of the food items themselves.